

Soil Is Not Trivial



LEVEL: Grades 5-12

SUBJECTS: Language Arts, (Communication), Social Studies (Government, History), Earth Science

SKILLS: Analyzing, applying, brainstorming, collaborating, communicating, comprehending, developing vocabulary, discussing, following directions, formulating questions, listening, locating, critical reading, solving problems, thinking creatively, writing



MATERIALS

Writing materials, scissors, dictionaries and photocopies of the attached **Who?**, **What?**, **Why?**, **How?** fact sheets, **Soil Cards**, **Blank Cards**, **Local Soil Conservation Action Plan** sheets, and highlighter pens.

VOCABULARY

conservation, drought, Dust Bowl, erosion, tillage, topsoil (Additional words from the Supporting Information and fact sheets can be selected as needed.)

RELATED LESSONS

From Apple Cores to Healthy Soil
Perc Through the Pores
Till We or Won't We?
In Harmony

SUPPORTING INFORMATION

The issues the world is facing today with respect to the conservation of soil and water resources are not new. They are the result of centuries of human interaction with these resources. These interactions have had both positive effects (terraces, irrigation development, land reclamation) and negative impacts (accelerating soil erosion, salination of

soils, water pollution) on soil and water resources. There are two major types of soil erosion, erosion caused by wind and erosion caused by water. This lesson deals primarily with the erosion caused by wind, which brought the issue of soil erosion to the public's attention.

Efforts at soil conservation began among U.S. farmers even before the American

Revolution. Some colonial Americans were concerned about good soil being washed or blown away. The methods they used to increase soil fertility and reduce soil erosion included maintaining ground cover (plants whose roots hold soil in place), using pastures, legumes, and crop rotation systems. Many of their soil conservation practices are still used today. Jared Eliot lived during colonial times (1685-1763) and is recognized as an early pioneer in preventing soil erosion. He experimented with and wrote about erosion, but his warnings went largely unnoticed. Both George Washington and Thomas Jefferson experimented with soil conservation practices and other ways to improve their farms. Washington had mud dredged from the bottom of the Potomac River and applied to his fields. He also built diversion ditches dug to reduce soil erosion during heavy rains. Jefferson practiced crop rotation and experimented with new varieties of peas to improve soil fertility and structure. Patrick Henry is said to have proclaimed (about the general population) after the American

BRIEF DESCRIPTION

Using facts about the Dust Bowl, students write questions and play a trivia activity focused around the establishment of a national soil conservation program and the importance of soil. Students then explore and/or develop a plan to address a local soil conservation issue.

OBJECTIVES

The student will:

- analyze, evaluate and retrieve information on the history of the national soil conservation movement in the United States;
- detail the events that led to the development of the Natural Resources Conservation Service and conservation districts;
- discuss why soil still needs to be protected today; and
- select and investigate a local soil conservation issue or develop a plan to address the issue.

ESTIMATED TEACHING TIME

Session One and Session Two: 45 to 60 minutes.
Session Three: 45 to 60 minutes, plus additional time to prepare class presentations.
Session Four: Time will vary depending on the number of team presentations and/or implementation of the students' action plans.

Revolution, "Since the achievement of our independence, he is the greatest patriot who stops the most gullies."

Although some Americans practiced soil conservation, erosion continued to be an increasing problem in the late 19th and early 20th centuries. By the late 1800s, agriculturists at land-grant colleges were promoting the importance of the soil. Around the turn of the century, the United States Department of Agriculture (USDA) began to publish information about methods of conserving soil and reclaiming "exhausted" land.

It was not until the 1930s that the American public first recognized the magnitude of soil erosion problems. While soil erosion is a natural process (a major factor in the formation of soil), human action can accelerate it. Americans learned firsthand that soil is not trivial. This was a time when dust storms were occurring over the Midwest, especially in a 150,000-square-mile area encompassing the Oklahoma and Texas panhandles and neighboring sections of Kansas, Colorado and New Mexico. This area of the southern Great Plains region became known as the Dust Bowl.

In 1931, the first of a series of severe droughts during the 1930s hit the Great Plains. Crops failed as plants weakened and died. During 1932, most soil erosion was local, as were the resulting dust storms, largely confined to sandy soil where wheat, corn and cotton crop failures had left the ground bare. Dust storms became more common in spring 1933. Insufficient and poorly distributed rainfall and dry winds, with above average velocity, created dust storms that caused widespread damage in the southern Great Plains. In spring 1934, the entire nation became alarmed about the growing menace of the dust storms. The dust reached Washington, D.C., and beyond. Dust fell even on ships hundreds of miles out at sea.

When severe drought struck the Great Plains from 1934 to 1937, the soil lacked the extensive root systems of prairie grasses as an anchor. This was the result of the cultivation practices that occurred with the western expansion of the United States. The combination of reduced prairie grass cover, stunted

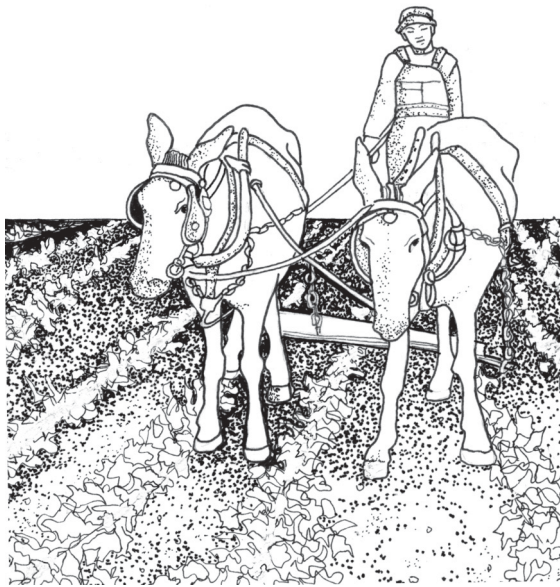
plants, dry soil, and strong winds allowed the winds to pick up the loose topsoil and swirl it into dense dust clouds. Recurrent dust storms choked cattle and pastures. Before long, millions of acres of land were affected by wind erosion. As soil eroded, the area was losing its precious resource and its ability to produce crops. Millions of dollars of crops were destroyed by the drought and resulting dust storms. The link was made between poor, eroded land and the poverty of the people trying to make a living on it. Living in poverty, rural people could not afford the improvements needed to solve the problems. A few leaders realized that they would have to convince Congress to intervene to provide the education and support needed to implement conservation practices such as planting trees and ground covers and contour farming, which would protect the soil resources.

Nothing equaled the "black blizzards" that blew during 1935. Dust made the air so dark that lights had to be left on during the day. The dust choked thousands of animals on farms. Many people wore masks that filtered out the big particles, but the masks were not much help. Children and older people got pneumonia and other lung infections. Life seemed to be put on hold as schools and businesses were shut down. Even funerals had to be postponed; the fierce dust storms made it impossible to bury the dead.

Finally, in the summer of 1938, rain once again began to fall over much of the Dust Bowl. With assistance from the government in the form of education, seed and trees, farmers were able to plant soil-holding crops and by spring

1939 the Dust Bowl had shrunk to its smallest size since 1932. Only 9.5 million acres were subject to severe wind erosion, a significant decrease from 50 million acres in the winter of 1935 and 1936. Although dust storms continued in 1939, they did not last as long and the winds were not as intense. Ample rain returned to the area in the summer and autumn of 1940.

During cycles of drought, dust storms of a smaller magnitude returned to the southern Great Plains in the 1950s, 1970s and 1980s. To some degree, dust still blows within the Great Plains today when drought, winds and sparse vegetative cover provide the necessary conditions. The severe storms, with choking dust, which turns day into night for consecutive weeks, have not been seen since the 1930s.



The work to prevent soil erosion and conserve water resources continues in today's Natural Resources Conservation Service (NRCS) and local conservation districts. In 1992, when the last survey of our natural resources was taken, rates of soil loss due to wind and water erosion were down by 24 percent from the preceding 10 years. It was still estimated, during the same period, that 2.1 billion tons of topsoil were lost to erosion. Protection of natural resources is an ongoing challenge.

GETTING STARTED

Gather writing materials, scissors and dictionaries. Photocopy **How?**, **Who?**, **What?**, and **Why?** fact sheets, one per student, and **Local Soil Conservation Action Plan**, one per team of four students. Photocopy one set of the **Soil Cards** for each two teams (teams work in pairs in Session Two). Make one extra photocopy of the **Soil Cards**. Cut this copy apart and separate the cards by who, what, why or how questions. Photocopy enough of the **Blank Cards** sheet so each student gets three blank cards and highlighter pens. (Note: You may need to make photocopies of the Supporting Information. See Session One, Step 4.)

PROCEDURE

SESSION ONE

1. Set the background for this lesson by sharing the Supporting Information. The information will help students understand that soil erosion in America is not a new issue. It also will provide details about the Dust Bowl and erosion caused by wind. Ask:

- Who was one of the early pioneers to present soil erosion as a national problem? (*Jared Eliot*)
- What are the names of the states that were part of the region known as the Dust Bowl? (*Texas, Oklahoma, Kansas, New Mexico, Colorado*)
- What were the "black blizzards?" (*fierce dust storms that darkened the air with blowing dust*)
- What year had the worst dust storms? (*1935*)
- Who got pneumonia and other lung diseases? (*children and older people*)
- How far did the dust travel by spring 1934? (*It traveled past Washington, D.C., and hundreds of miles out at sea.*)
- Why was the ability to produce food crops lost during the Dust Bowl? (*The topsoil was eroding and there was a lack of adequate rainfall to grow crops.*)

- Why was the Dust Bowl smaller in size by spring 1939? (*The rains returned in 1938 and farmers were able to plant crops to hold the soil in place.*)

2. To prepare students to write questions from the fact sheets, ask:

- What do these questions have in common? (*Possible responses include a question asked who, what, how, or why; each question was specific and had one right answer; and the questions could be answered from the information in the reading.*)
- What makes a good question? Write responses in a visible place for use in Step 6. (*Possible responses include: questions should reflect the main ideas and the facts; questions should be specific and lead to one answer; and questions should be stated clearly.*)

3. Explain to students that they will be creating and playing a trivia activity about soil and the history of the soil conservation movement in the United States. Students will learn about **how** the Dust Bowl was created, **who** was involved in establishing a national soil conservation program during the Dust Bowl, **what** the Natural Resources Conservation Service and conservation districts do, and **why** soil and soil conservation are important. Ask the students to:

- Describe trivia. (*odd tidbits of interesting but perhaps unnecessary information*)
- When is trivia used? (*during games, in conversation to capture interest, in the **Guinness Book of Records***)

Explain that the United States is an incredibly complex society and economy. As a world leader in technology, scientific research, and agriculture, we possess an immense amount of knowledge. This leads businesses and careers in the United States to be very specialized. Information that may appear to be trivial to some may be very important and useful to others. For this economy and society to work effectively, all of these businesses and careers provide an important piece of an intricate puzzle. The foundation of both our economy and society is the food system and the land it depends upon. While most of us are not actively working on the land, we are all dependent upon it for our daily needs. This activity may use a trivia format, but soil is not trivial.

4. Divide the class into teams of four students. Distribute a different fact sheet to each student within the team. Make teams of five with extra students, and assign the supporting information to the fifth student.
5. Students leave their team and join a larger group of students (jigsaw) who have the same fact sheet (e.g., **How?** group, **Who?** group and so on.) This is called a jigsaw group. Provide each “jigsaw group” three **Blank Cards** per student, a dictionary and highlighters. Explain that each student reads his or her fact sheet, uses the dictionary to look up new words, and underlines or highlights important information.
6. Each student in the group writes three questions, one per blank card, using the information from his or her fact sheet. Remind students of their criteria for good questions (Step 2). Explain that students



can ask questions that begin with who, what, why or how. They do not have to ask only who questions from their **Who?** fact sheet or only how questions from their **How?** fact sheet and so on. Give each group the three **Soil Cards** that pertain to their group so students do not duplicate these questions. Encourage students to discuss and edit their questions with group members. When groups are finished writing their questions, have students save them for Session Two.

Optional: The activity can be done as a whole-class activity. Divide the class into four groups of students. Distribute the **Who?**, **What?**, **Why?** and **How?** fact sheets to different groups (e.g., **Who?** group, **What?** group and so on.) Each group reads

the information and writes three questions, one per blank card. These 12 questions will be added to the 12 questions from the **Soil Cards**. You or a student reads a question to one group. If the group answers correctly, it gets the card; if not, the card goes into the discard pile. Continue reading questions going from group to group. Once the cards are gone, read the cards in the discard pile. Any questions that remain unanswered can be given to the groups to find answers on their fact sheets.

SESSION TWO

1. Ask students to return to their original team. Form pairs of teams to play the activity as opponents. (If you have an uneven number of teams, form a group of three people.) Distribute one copy of the **Soil Cards** and scissors to each paired team. Ask one student to cut the cards apart. Ask another student to collect the questions written by each student and shuffle them into the **Soil Cards** questions. Each pair of teams will have a total of 24 cards (27 to 30 cards for teams with five students). All the cards should be stacked face down in a pile.

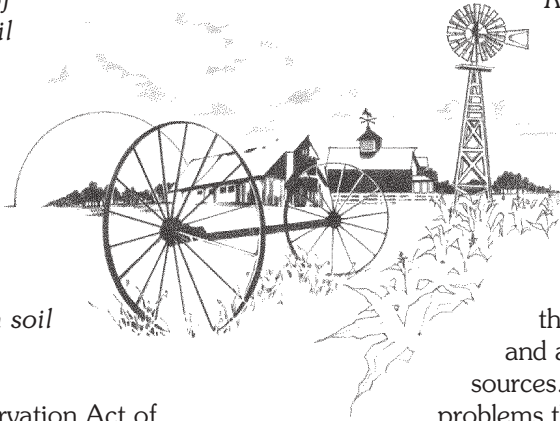
Optional: To increase the learning experience, begin the session with students in their “jigsaw groups.” Ask one student in each group to collect the question cards, shuffle them, and then give each student three cards. This will further decrease the chances of a student getting all of his or her own questions when paired with another team.

2. Teams and students within each team take turns asking questions of the other team. Play begins with a student from one team taking a card and asking the opposing team the question. Teams have 20 seconds to confer before giving an answer. Only one answer may be given by one student. If the team gets the correct answer, the team claims the card; if they answer incorrectly, the card goes into a discard pile. Teams alternate asking questions and continue to play the activity until all the cards have been read. Next, have each paired team discuss and answer the questions in its discard pile.

Optional: Permit students to use the fact sheets during the activity to locate information. Or, only permit students to use the fact sheets to answer questions in the discard pile.

3. Summarize this session by asking:
 - What factors contributed to the creation of the Dust Bowl? (*Factors include westward expansion, removal of the prairie grasses, drought, technology, World War I, and the stock market crash of 1929.*)

- Who were some of the key players in the soil conservation movement during the 1930s? What was their contribution? *(Hugh Hammond Bennett became a leader in soil conservation because of his writings, experiment stations, demonstration projects, and role as the head of the Soil Erosion Service (SES) and the Soil Conservation Service (SCS). The SES and SCS provided materials and planning assistance to help farmers install conservation measures. Congress passed and Roosevelt signed the Soil Conservation Act of 1935. The Civilian Conservation Corps (CCC) and the Works Projects Administration (WPA) provided people to work on soil conservation projects. Dr. Walter C. Lowdermilk assisted Bennett in the SES and SCS and applied the successes and failures of other cultures to the soil erosion problem in the United States. Milburn L. Wilson, as assistant secretary of Agriculture, proposed the creation of conservation districts. Conservation districts involved local people in soil erosion problems.)*



- Why was the Soil Conservation Act of 1935 important to the soil conservation movement? *(It created a permanent agency that would work to control and prevent soil erosion. It also gave the SCS the authority to provide a soil erosion program for the entire nation.)*
- How did conservation districts help the soil conservation movement? *(They involved local people in local soil erosion problems and solutions.)*
- How did the Dust Bowl change the way people protect the soil to prevent wind erosion? *(It made people realize the importance of using soil conservation methods such as strip cropping, terracing, and leaving crop residue on the soil for protective cover.)*
- Have you noticed erosion caused by water? *(muddy streams and rivers, silting in of rivers and ponds, creation of river deltas, islands formed in streams, banks of rivers and streams cut away, etc.)*

- Why is soil important to you? Why is soil important to your community?
- Do you think it's important to conserve natural resources like soil? Why or why not? *(We are still losing valuable topsoil. Soil affects the capability of farmers and ranchers to grow crops and raise livestock, which in turn affects the food supply for people and animals. Soil erosion affects our air and water quality and potentially the health of people, plants and animals.)*
- How can you and your classmates use what you have learned to solve soil erosion problems at your home or school or in your community? *(Consult with the local Natural Resources Conservation Service (NRCS) offices and conservation districts to learn about local natural resource issues. Make a decision on an important issue and work to address it.)*

SESSION THREE

1. Gather and/or ask students to gather newspaper articles, letters to the editor from your local newspaper, and articles and photographs from other sources. Look for issues related to soil problems that might be present in your school or community. Brainstorm a list of soil issues about which students are concerned. Post it in a visible place so students can reflect on issues they would like to investigate or with which they may want to become involved.

Optional: Consider asking appropriate speakers, such as a member of local government, a farmer, a parent who volunteers for a conservation or environmental group, or an employee or board member from a local conservation district to speak to your class about the issues. Provide time for students to prepare questions for the speaker(s).

2. Form teams of four students. Ask each team to select one issue it wants to investigate. To help students design their plan, distribute one copy of the **Local Soil Conservation Action Plan** to each team. Each team member should take responsibility for completing one part of the plan.
3. Once teams are satisfied with their action plans, give them time to prepare to present their plan to the entire class. Encourage demonstrations, posters, learning centers, and skits rather than lecture

presentations. Each team member should participate in the presentation.

SESSION FOUR

1. Conduct the team presentations. Provide time for students to ask questions at the end of each presentation.
2. If possible, have the students carry out their action plans. Working together as a class may simplify the effort. Have the students vote on the action plan they would like to begin with first. Help students identify specific assignments and a time line. Be sure to include a variety of community members to provide the support necessary to a plan's success.

EVALUATION OPTIONS

1. Use the fact sheets to create a time line detailing the events that led to the creation of the Soil Conservation Service and the conservation districts.
2. Evaluate questions written by individual students and see if they used the criteria identified by the class.
3. Evaluate how well students worked cooperatively in the jigsaw groups and while playing the activity.
4. Evaluate enthusiasm, effectiveness and long-range commitment of students to the action plan they developed in Session Three.
5. Have students complete one or more of the following statements.
 - Soil is important because...
 - Soil conservation is important because...
 - I can help reduce soil erosion by...
 - The Dust Bowl could or could not (choose one) happen again because...

EXTENSIONS AND VARIATIONS

1. Have students interview farmers, conservation district directors or supervisors, extension agents or local Natural Resources Conservation Service (NRCS) officials to learn about soil conservation practices used in your area. Then visit sites where these practices are in use.
2. Invite students to use various media to do some additional research.
 - A. Make the Supporting Information and the **How?** and **Who?** fact sheets available to students so they can research more details about the Dust Bowl. If you live in one of the Dust Bowl states, find out what happened and,

if possible, have students interview people or bring in people who lived during the Dust Bowl years.

- B. Learn more about the contributions of the Civilian Conservation Corps (CCC) and the Works Project Administration (WPA). What kind of work did they do that promoted soil conservation? How did the WPA impact public works, public art, music, photography, and the involvement of black artists and other minorities during the Depression?
 - C. Research early conservationists and their contributions. Some suggested names are Jared Eliot, Samuel Deane, Solomon and William Drown, Isaac Hill, John Lorain, John Taylor, Nicholas Sorsby, Edmund Ruffin and Aldo Leopold. Contact your local NRCS office for a copy of Early American Soil Conservationists, Miscellaneous Publication No. 449, USDA, Soil Conservation Service, 1941.
3. The Dust Bowl prompted a cultural response from artists like Dorothea Lange, Woody Guthrie and John Steinbeck, who lamented the American economic ethos that had created the disaster. Share the richness of their work with your students.
 - A. Display a copy of Dorothea Lange's famous photo, "Migrant Mother" and discuss what life must have been like through her eyes.
 - B. Ask students to look up the songs and writings of Woody Guthrie and share their findings by playing some of his songs in class or reading excerpts from his writings. See the Pete Seeger reference in Resources for a possible starting place.
 - C. View the video of "The Grapes of Wrath" or read the book by John Steinbeck. Follow with discussions and student interviews with people who experienced the Dust Bowl years.
 4. Ask students to imagine they are newspaper reporters in the 1930s. Give them one or more of the following headlines: "Soil Erosion is Under Control," "Soil Erosion is Losing Ground," and "Soil Loss: The Answer May Be Blowin' in the Wind." Have students research and write the story.
 5. Allow students to make bumper stickers or cartoons that depict soil erosion or soil conservation. Cartoons often convey an important message with an eye-catching sketch. Invite students to research the cartoons by syndicated cartoonist Jay "Ding"

Darling (1876-1962). Some of his cartoons lamented the loss of soil. As one of the most influential and most often reprinted cartoonists in America, he was able to reach and teach thousands with his cartoons relating to soil and wildlife conservation.

6. Have students locate reliable information sources and develop an activity for other conservation subjects of their choice, such as endangered plants and/or animals, wetlands, water, renewable energy, and so on.
7. Use this question-and-answer methodology with new vocabulary words used in each of the fact sheets. Have students write each word and its definition on individual index cards. One student should read the definition, and another must give the word that is defined.

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ADDITIONAL RESOURCES

Adopt An Acre Program. Contact your local or state farm bureau (not available in all states). Students work a piece of land “adopted” or rented in conjunction with a local media outlet. Reporters visit on a regular basis to report on students’ efforts.

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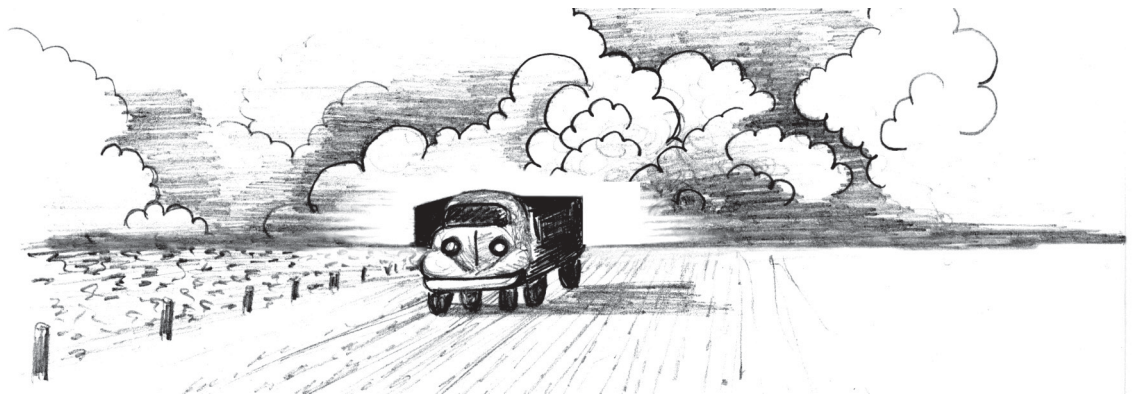
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WHO?

Directions: *Who was involved in establishing a national soil conservation program in the United States during the time of the Dust Bowl?* Read carefully to find out. Underline or highlight details and important ideas that would make good questions. Circle words to look up in the dictionary.

Hugh Hammond Bennett was a soil scientist with the U.S. Department of Agriculture (USDA) from 1903 to 1933. He began writing and speaking about the menace of soil erosion in the 1920s. His soil survey experience convinced him that erosion was causing serious and permanent harm in America. In 1928, the USDA published *Soil Erosion: A National Menace*, co-authored by Bennett and William R. Chapline. It provided a general survey of erosion conditions and was used to gain support from Congress for a national soil conservation program. In 1929, Bennett received federal funds to establish soil erosion experiment stations so farmers could observe soil conservation practices and then implement them on their land.

The Soil Erosion Service (SES) was established in 1933 as a temporary agency of the U.S. Department of the Interior. Its purpose was to study soil erosion and begin demonstration projects near the experiment stations. Under Bennett as director, the SES used federal funds to carry out demonstration projects on private lands. Farmers could sign five-year agreements to install conservation measures. SES provided equipment, seed, seedlings, planning assistance, and labor from the Civilian Conservation Corps (CCC) or the Works Projects Administration (WPA). As SES was working on the national reconnaissance erosion survey in 1934, major dust storms hit the Great Plains.

The Soil Conservation Act of 1935 was passed by Congress and signed by President Franklin D. Roosevelt. It changed the temporary status of SES to a permanent agency - the Soil Conservation Service (SCS) - within the USDA. Bennett became the chief of the new agency. This act authorized SCS to work beyond the demonstration projects to create a program for the entire nation that would work to control and prevent soil erosion. The government provided some equipment and supplies, labor from the CCC and the WPA, and technical advice from people trained in soil conservation methods. Bennett earned a reputation as a leader in soil conservation and as the "father of soil conservation."

Dr. Walter C. Lowdermilk served as the vice director of the SES and then as the assistant chief of the SCS. Lowdermilk added runoff and erosion studies to the demonstration projects. He believed SCS staff working in the field with farmers should be called "land doctors," and serve as "general practitioners of the conservation sciences." Lowdermilk traveled to Europe, the Mediterranean area, and the Middle East to study agriculture. He wanted to learn how their successes and failures could help solve erosion problems in the United States.

SCS found the demonstration projects had little influence beyond 50 miles of their boundaries. For the work to spread nationwide and have an impact on the way people farmed, local farmers had to become more involved in planning and carrying out the work. Milburn L. Wilson, as assistant secretary of Agriculture, proposed the creation of conservation districts to address this concern. The Standard State Soil Conservation Districts Law was prepared as a model for the states to use as a means to involve local farmers in soil conservation. Roosevelt sent it to the state governors in February 1937, and suggested that each state adopt such a law to organize conservation districts as part of a national effort to conserve soil. Arkansas passed the first such act in March 1937. The districts enhanced and expanded the soil conservation movement in the United States by directly involving landowners and operators at the local level.



WHAT?

Directions: What is the role of the Natural Resources Conservation Service and conservation districts regarding soil conservation today? Read carefully to find out. Underline or highlight details and important ideas that would make good questions. Circle words to look up in the dictionary.

Since October 1994, the Soil Conservation Service (SCS) has been called the Natural Resources Conservation Service (NRCS). The name change of this federal agency reflects the vision and the need to protect all natural resources - soil, water, air, wildlife and plants - as a whole. The NRCS still does what the SCS did: provide technical assistance to the nation's farmers and ranchers (in cooperation with the nation's conservation districts) to plan and apply soil and water conservation practices on the privately owned farm, grazing and forested lands of the nation. It still provides information and technical assistance and encourages voluntary use of soil and water conservation practices to help farmers, ranchers and others restore, enhance and protect the land.

Like the SCS, the NRCS is a field-oriented agency. NRCS employees work in field offices located in nearly every county throughout the United States. Most of them work in county offices and help local landowners, conservation district staff, and community groups identify and work with natural resource issues and problems. NRCS field staff assist with the development of individual conservation plans and the application of soil and water conservation practices on private land. Because conservation is more than preventing soil erosion, the agency also is involved in protecting water quality and supply, conserving wetlands, providing fish and wildlife habitat, and conducting natural resource inventories. NRCS employees also provide scientific and technical support to the people working in the field.

NRCS works in cooperation with about 3,000 conservation districts. Depending on the state, they may be identified as soil conservation districts, soil and water conservation districts, conservation districts, natural resources conservation districts, natural resource districts, or resource conservation districts. Districts serve the 50 states, District of Columbia, Puerto Rico, Virgin Islands, Northern Mariana Islands, and Guam. As units of local government, local citizens organize the districts under state, and in a few cases tribal, law. They operate on the premise that local people know the most about local soil and water conservation issues.

As resource management agencies, the districts are responsible for setting priorities and carrying out a program for the conservation, use and development of soil, water and related resources. From their beginning in 1937, the districts have used a cooperative approach. They coordinate and implement natural resource and environmental programs at the local level in cooperation with federal and state agencies. They also work with land managers, local government agencies, and other local interests to address resource concerns such as erosion control, flood prevention, water uses and conservation, wetlands, groundwater, water quality and quantity, forest land protection, wildlife, recreation, wastewater management and community development.



WHY?

Directions: *Why are soil and soil conservation practices important?* Read carefully to find out. Underline or highlight details and important ideas that would make good questions. Circle words to look up in the dictionary.

The ground beneath your feet is teeming with life. Soil is a complex, dynamic mixture that is essential for terrestrial life. It is important for many reasons from the basic production of food to the more complex clean up of human-generated pollution.

Most plants get their nutrients, water and support from the soil in which they grow. From the nutrients and water, in the presence of light, they produce sugars, starches, proteins, fats and oils. Animals and people get their nutrients by eating plants or other animals that eat plants. Soil is the foundation of agricultural productivity. Farmers and ranchers depend on soil to grow crops for people and livestock.

Some animals make their home in soil. For example, earthworms, ants, termites, prairie dogs, gophers, ground squirrels, moles, and field mice burrow through the soil. By burrowing into the soil, the animals mix the soil and open channels so water and air can reach plant roots and other animals and organisms living in the soil. Soil contains millions of living microscopic organisms called microbes. Microbes decompose organic matter in soil, providing the nutrients plants need to grow. Microbes in the soil also help break down organic and inorganic materials such as municipal and animal wastes, pesticides and fertilizers.

Soil filters or regulates water in the water cycle. Precipitation that falls on the land: 1) runs over the land surface, 2) moves laterally through the soil to a surface water body, 3) moves down through the soil to groundwater, or 4) remains held in the soil to be used by plants.

Soil stores and cycles nutrients such as carbon or nitrogen. Some bacteria and other soil organisms (algae) take gaseous nitrogen from the air and change it into a chemical form that plants can use. It is estimated that the organic matter in the soil stores as much as three times more carbon than does all of Earth's vegetation. Holding the carbon in this manner reduces the build up of carbon dioxide – a greenhouse gas – in the atmosphere and thus helps to stabilize global climate.

Although soil erosion is a natural process, human actions can speed up the process. Soil erosion in some parts of the United States is still occurring at a rapid rate, far more rapid than soil can be naturally regenerated. Soil formation is a slow, continuous process. New soil material gradually forms as minerals break down due to chemical and biological processes. It is estimated that since the 1600s, the United States has lost at least one-third of its topsoil to wind and water erosion. According to the 1997 National Resources Inventory Revised Edition completed by the Natural Resources Conservation Service, the erosion rate on all cropland was 5.0 tons of soil per acre per year. This is a significant change from 1982 when the erosion rate was 7.3 tons per acre per year.

Soil conservation practices such as contour farming, terracing, strip-cropping, minimum tillage, no-till farming, crop rotation, and leaving crop residue can help minimize soil erosion and the loss of valuable topsoil. This also helps reduce the effects of soil erosion on the quality of our water and air. Soil may carry potential contaminants to nearby water bodies reducing the water quality and fish habitat. Wind puts dust particles into the air, causing air pollution and, for some people, health problems. Soil conservation is as important today as it was in colonial times.

HOW?

Directions: *How did the destruction of the soil lead to the creation of the Dust Bowl?* Read carefully to find out. Underline or highlight details and important ideas that would make good questions. Circle words to look up in the dictionary.

Settlers in the 19th and early 20th centuries (often immigrants) were encouraged to settle the prairies, driven by the American goal of expansion and their own “American Dream.” The number of farms within the Great Plains area almost doubled, increasing from about 5,700 farms in 1890 to more than 11,000 in 1910. As the number of farms increased, prairie grasses were replaced with cultivated crops such as wheat, corn and cotton. When land was first cleared and cultivated, there was nothing to hold the soil in place against rain and wind. As farmers continued to cultivate the land, the soil was broken into smaller finer pieces, increasing its vulnerability to wind erosion. A decrease in prairie grasses also meant less pasture for cattle grazing. This led to the overgrazing of the remaining prairie grasses. Some farmers allowed their cattle to graze the fields until all of the stubble had been eaten. This left the ground unprotected from wind. Some farmers burned off the stubble, a practice that gave little back in the way of organic matter. Crop residue is an important source of organic matter, returning nutrients to the soil. With the loss of organic matter, soils are less able to absorb moisture and support vegetation. As soil moisture decreases, the potential for wind erosion increases.

Technology provided for increased use of power machinery. Tractors, multi-row plows, and combines replaced horses and single plows. Farmers were able to plant and harvest more acres of crops than in previous years. Overproduction caused prices to fall. Farmers compensated for the lower prices by planting more acres in wheat, once again reducing the prairie grasses.

World War I resulted in a boom in wheat demand. Wheat prices in the Dust Bowl states increased from an average of 91 cents per bushel to more than \$2 per bushel by 1917. Farmers plowed millions of acres of prairie grasses - the greatest removal than in any of the previous years - to plant more wheat. Great Plains farmers largely ignored conservation practices to plant more crops. After the war, when the high prices collapsed in the early 1920s, more land was cleared to plant more wheat to offset the economic loss. The average farm size increased from about 465 acres in 1910 to about 810 acres in 1930.

The stock market crash of 1929 resulted in an economic disaster known as the Depression. Wheat prices dropped from 99 cents per bushel in 1929 to 34 cents per bushel in 1931. Farmers who had used soil conservation practices could no longer afford to do so. They did not have the resources to spend on additional seed and fertilizer or to provide fuel for their machinery or feed for animals.



A drought began in the summer of 1931 and lasted seven years. The most severe drought on record occurred from 1934 to 1937. With normal precipitation, wheat plants were able to hold the soil and provide protection against wind erosion. The lack of precipitation resulted in crop failure. Without soil-holding crops and protective cover from prairie grasses, the nearly constant winds picked up fine soil particles and carried them away.

SOIL CARDS

(Cut cards apart.)



Q: What was the name of the Natural Resources Conservation Service before 1995?

A: Soil Conservation Service

Q: What does NRCS stand for?

A: Natural Resources Conservation Service



Q: How did the stock market crash of 1929 add to the soil erosion problem?

A: Farmers could not afford to use soil conservation practices.

Q: How did technology add to the soil erosion problem?

A: Power machinery made it possible for farmers to remove more of the prairie grasses and plant and harvest more crops.



Q: How does organic matter help reduce wind erosion?

A: It helps the soil absorb moisture so plants can grow and hold the soil particles together.

Q: What is a conservation district?

A: A unit of local government organized under state law by local citizens, responsible for carrying out conservation programs at the local level.



Q: Who was the main person responsible for telling Congress and the nation about soil erosion in the United States?

A: Hugh Hammond Bennett

Q: Why do animals need soil?

A: Animals eat plants or other animals that eat plants, which grow in soil. Some animals make their homes in soil.



Q: Who worked on the national reconnaissance erosion survey in 1934?

A: Soil Erosion Service (SES)

Q: Why is soil important to the water cycle?

A: Precipitation that falls on the land: 1) runs over the land surface, 2) moves laterally through the soil to a surface water body, 3) moves down through the soil to groundwater, or 4) remains held in the soil to be used by plants.



Q: Who gave the Soil Conservation Service the authority to create a soil conservation program for the entire nation?

A: Congress and President Franklin D. Roosevelt

Q: Why might soil conservation be important to someone's health?

A: It helps keep soil particles out of the air so people do not breathe them. It helps keep soil and possible contaminants out of the water that people may drink.

BLANK CARDS

(Cut cards apart.)



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LOCAL SOIL CONSERVATION ACTION PLAN

(Cut cards apart.)

Directions: Discuss your plan as a team. Then have each team member choose what part of the plan he or she will be responsible for completing. Cut apart the paper so each team member can complete the details for their part of the plan.



Our soil conservation issue is _____

My task is to answer the WHY questions about the issue. Why do we care? Why is this important to other people? Why should we do something about it?



Our soil conservation issue is _____

My task is to answer the HOW questions about the issue. How can we make our plan work? How do we get started? How can we continue?



Our soil conservation issue is _____

My task is to answer the WHO questions about the issue. Who is going to do what in our team? Who do we need to get permission from to take action? Who can help us take action?



Our soil conservation issue is _____

My task is to answer the WHAT questions about the issue. What should be done? What can we do as a team or as a class? What might the results be in 10 years?

*A conservationist is one who is humbly aware that
with each stroke he is writing his
signature on the face of his land.*

Aldo Leopold, A Sand County Almanac